THIS IS ONE VOLUME OF A SIX VOLUME SET WHICH INCLUDES

VOLUME I FIELD OPERATIONS (FO)
VOLUME II GROUNDWATER (GW)
VOLUME III GEOTECHNICAL (GT)
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ENVIRONMENTAL MANAGEMENT DOCUMENT CHANGE NOTICE (DCN)

Procedure Number 5-21000-OPS-GW 08, Rev 0 | 5/21/92

Title	Date	DCN Number
Aquifer Pumping Tests	May 20, 1992	5-21000-OPS-GW 08, R1 — OCN 92-01

Expires 12-31-92 RGS 5/21/92 Procedure Revision Required [X] Yes [ ] No CM 5/21/9

Scope Limitation none

Item Number	Page	Step or Paragraph	Changes (Use DCN CONTINUATION SHEET for Additional Space)
1	17 of 43	Paragraph 2	Change the final sentence to, "Drawdown in the pumping well will not exceed 25 percent of the saturated thickness " instead of the 20 percent currently specified
2	13 of 43	5 2 3 2	Revise section 5 2 3 2 to read (see continuation sheet)

Justification (Reason for Change – Provide Numbers To Reference Corresponding Items Above)

1 This limitation is specified for correcting drawdowns in unconfined aquifers and is allowable up to 25 percent of the saturated thickness, per J Bear (1979), "Hydraulics of Groundwater," and other sources

2 The backflushing procedure currently specified for developing aquifer testing wells is too restrictive and impractical for application to small diameter wells Alternate methods are proposed in accordance with the discussion provided in Aller (1989), "Handbook of Suggested Practices for the Design and Installation of Groundwater Monitoring Wells "

Concurrence	Organization	Req	Date	Concurrence	Organization	Req	Date
Nancy M Joy	QAPM	X	5/22/92	[illegible]	User	X	5/21/92
M C Rowland	EOM	X	5/21/92				

Approval of Responsible Manager	Date	Is Posting Reqd?	If Yes, By What Date?	Date Posted
R Jiraby for W S Busby	5/21/92	[X] Yes [ ] No		

OCN Form 001

ENVIRONMENTAL MANAGEMENT
DOCUMENT CHANGE NOTICE (DCN)

Procedure Number 5-21000-OPS-GW 08, Rev 0/ NWD

Title	Date	DCN Number
Aquifer Pumping Tests	May 20, 1992	5-21000-OPS-GW 08, R1 - DCN 92-01 CM 5/2

Expires 12-31-92 Procedure Revision Required [X] Yes [ ] No

Scope Limitation none

Item Number	Page	Step or Paragraph	Changes (Use DCN CONTINUATION SHEET for Additional Space)
3	11 of 43	Paragraph 2	After the first sentence in the paragraph, add, "The requirement for a sump may be waived in cases where partial penetration of the underlying confining layer may adversely affect the efficiency of the pumped or observation wells (i e , upward smearing of clays), or compromise the vertical hydraulic integrity of the confining layer for aquifer testing purposes, as determined by the project hydrogeologist "

Justification (Reason for change – Provide numbers to reference corresponding items above)

3 In some cases, installation of a sump below the base of the aquifer will have an undesirable effect on test conditions as described above The absence of the sump should not affect well performance over the time period required for aquifer testing

Concurrence	Organization	Req	Date	Concurrence	Organization	Req	Date
[signature]	QAPM	X	5/22/92	[signature]	User	X	5/21/92
[signature]	EOM	X	5/21/92				

Approval of Responsible Manager	Date	Is Posting Reqd?	If Yes, By What Date?	Date Posted
R Jurgensen for W S Bunby	5/21/92	[X] Yes [ ] No		

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ENVIRONMENTAL MANAGEMENT
DOCUMENT CHANGE NOTICE (DCN)

Procedure Number 5-21000-OPS-GW 08, Rev 01 mds

Title	Date	DCN Number
Aquifer Pumping Tests	May 20, 1992	5-21000-OPS-GW 08,R1 – DCN 92-01

Expires 12-31-92 Procedure Revision Required [X] Yes [ ] No CM 5/21/92

Scope Limitation none

Item Number	Page	Step or Paragraph	Changes (Use DCN CONTINUATION SHEET for Additional Space)
4	24 of 43	5 3 3 (end of section)	Add at the end of section 5 3 3 to read, "When the only objective of aquifer testing is to assess the maximum well performance of single wells (i e , average discharge or volume of groundwater produced at maximum drawdown), the step-drawdown test procedure may be modified to conduct a single step, variable discharge, quasi-constant head test This test will be conducted using a bailer or pump for drawing down the water level to the bottom of the well and sustaining this drawdown by constant pumping or bailing of low-yield wells Water level measurements will be collected at the beginning and end of each pumping cycle, or at regular intervals during constant pumping to assure that maximum drawdown conditions are maintained in the well Discharge will be measured volumetrically using a graduated bucket and stopwatch, or an accumulating flow meter, whichever is more appropriate The test duration will be determined in the field by the project hydrogeologist based on well responses and testing objectives The use of an electronic pressure transducer and data logger system for measuring water levels is optional, but generally will be limited to pumped wells only

Justification (Reason for change – Provide numbers to reference corresponding items above)

4 This modification applies to situations where the objective of well testing is determining maximum well yield for purposes other than the determination of aquifer properties, such as transmissivity and stovativity There is currently no guidance for conducting this type of well production test, which is required in support of risk assessment activities

Concurrence	Organization	Req	Date	Concurrence	Organization	Req	Date
[signature]	QAPM	X	5/22/92	[signature]	User	X	5/21/92
[signature]	EOM	X	5/21/92				

Approval of Responsible Manager	Date	Is Posting Reqd?	If Yes, By What Date?	Date Posted
R. Jacobsen for W. S. Bradley	5/21/92	[X] Yes [ ] No		

DCN Form 001

DCN CONTINUATION SHEET

5 2 3 2 Well Development Procedures for Pumping and Observation Wells

Well development for new pumping test wells will be conducted no sooner than 48 hours after installation All aquifer pumping and observation wells, new and old, will be developed utilizing vigorous development methods such as surging, bailing, backwashing, overpumping, or equivalent, or any combination thereof Where pumping equipment is utilized, the choice for well development is a submersible or suction pump Surging will be accomplished using a bailer or solid weighted cylinder of suitable length Surge blocks and swabs will be used only when permitted by appropriate well construction and aquifer conditions Drilling or pump installation rig assisted well development may be required for certain well conditions (i e deep wells) and should be addressed during the early planning stages of the well drilling and aquifers test design process

Bailing provides a simple and effective method of simultaneously pumping and surging a well when appropriately applied to well development (Aller et al, 1989) The bailer should initially be filled with water, raised several feet above the water level, and allowed to free fall through the borehole until it strikes the surface of the water and attains full submergence This cycle should be applied repeatedly to surge the well prior to the removal of any water in order to loosen up particulate matter at the well bore face The full bailer should not be allowed to strike the bottom of the well Subsequent bailing will remove the suspended material generated during surging The procedure should be repeated until the well development criteria of section 5 2 3 3 are met This well development technique is especially suitable for shallow, low yield well applications

Pumping, or overpumping, combined with intermittent surging using a solid cylinder or bailer, is generally suitable for wells with higher expected yields and/or greater saturated thicknesses The procedure differs from the bailer method only in that a pump is used instead of a bailer for evacuating groundwater from the capacity bailers or solid cylinders to increase the surging action in wells completed with long saturated screened intervals Pumping periods and rates will be specified in the field by the project hydrogeologist based on consideration of turbidity levels, well yield, and drawdown factors

Backwashing involves alternatively turning a pump on and off to simulate a surging action in the well (EPA, 1987) Backwashing should be conducted at a pumping rate only slightly higher than the well can sustain to avoid clogging the well screen If necessary, distilled water or formation water with the sediment removed will be added to the well bore during the backwashing process to augment the volume of water depleted by periodic pumping to waste The process of backwashing involves raising a column of water almost to the surface, shutting off the pump and allowing the water to fall back into the well This process is repeated, starting and stopping the pump as rapidly as possible To minimize the possibility of damaging the pump as a result of sediment-locking, the pump should initially be started at reduced capacity and gradually increased The control box should be equipped with a starter lockout to avoid damage to the pump that may result when an attempt to start the pump is made while the pump is backspinning During the backwashing procedure, the well should occasionally be pumped to waste to remove sediment brought into the water column by the surging action (Driscoll, 1986) Backflushing efficiency may be limited by the available pumping equipment and should be used only if an effective surging action can be established in the well